

Patent Application of  
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for  
**CARTON DISPENSING MACHINE**

**CROSS-REFERENCES TO RELATED APPLICATIONS**

Not applicable.

**STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT**

Not Applicable.

**MICROFICHE APPENDIX**

Not Applicable

**BACKGROUND OF THE INVENTION**

1. Field of the Invention.

This invention relates to the field of vending machines. More specifically, the invention comprises a machine which stores and dispenses flat items such as cartons or boxes.

## 2. Description of the Related Art.

Cartons or boxes are often needed for transportation and storage of small items. Such cartons or boxes (which terms are understood to be interchangeable throughout the remainder of this disclosure) are often designed to fold or collapse into a flat state for more convenient storage when they are not in use. Such boxes are often unavailable when they are needed most.

As one example, travelers often arrive at the airport with items they intend to carry on board an aircraft. Due to the increasing state of air travel security, these travelers may be informed that they must check these hand-carried items. The traveler may not have a piece of luggage available. A box would therefore be useful. The airlines, however, are increasingly reluctant to furnish passengers with storage boxes. The present invention seeks to provide boxes on demand by storing and dispensing them through a vending machine.

## BRIEF SUMMARY OF THE PRESENT INVENTION

A vending machine for large flat objects such as collapsed boxes or garment containers. A cabinet is provided containing a plurality of flat objects in an upright orientation. A control box attached to the cabinet receives bills or coins as payment for an object contained within the cabinet - such as a box. Once payment is received, feed mechanisms propel the plurality of flat objects toward the front of the machine. A cross feed mechanism then propels a single flat object out a dispensing slot, where it can be grasped and removed by a user.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is an isometric view, showing the proposed carton dispensing machine.

FIG. 2 is a detail view, showing the control box.

FIG. 3 is an isometric view, showing a carton being dispensed.

FIG. 4 is an isometric view, showing a carton being dispensed.

FIG. 5 is a perspective view, showing the details of the vending machine's interior.

FIG. 6 is an isometric view, showing the left feed assembly.

FIG. 7 is an isometric view, showing the right feed assembly.

FIG. 8 is an isometric view, showing the crossfeed assembly.

FIG. 9 is a perspective view with a cutaway, showing the feeding process.

FIG. 10 is a perspective view with a cutaway, showing the feeding process.

FIG. 11 is a perspective view with a cutaway, showing the feeding process.

FIG. 12 is a perspective view with a cutaway, showing the feeding process.

FIG. 13 is an isometric view, showing the left drive helix.

FIG. 14 is a detail view, showing the feeding process.

FIG. 15 is a detail view, showing the feeding process.

FIG. 16 is a detail view, showing the feeding process.

FIG. 17 is a detail view, showing the feeding process.

FIG. 18 is a perspective view, showing the loading of the machine.

## REFERENCE NUMERALS IN THE DRAWINGS

10      carton dispensing machine      12      main door

14	display panel	16	base
18	right side panel	20	top panel
22	lock	24	control box
26	control box door	28	status panel
30	lock	32	change panel
34	LED display	36	ready light
38	exact change light	40	empty light
42	bill receiver	44	coin slot
46	coin return	48	dispenser slot
50	carton	54	carton cavity
56	upper beam	58	lower beam
60	fixed column	62	adjuster column
64	left side panel	66	crossfeed assembly
68	left feed assembly	70	right feed assembly
72	left pressure plate	74	right pressure plate
76	support panel	78	left backing plate
80	left support beam	82	gear motor
84	left drive helix	86	drive screw
88	right support beam	90	right drive helix
92	right backing plate	94	ejector
96	transverse screw drive	98	crossfeed bracket
100	lead carton	102	next carton

104	entrance stop	106	holding flange
108	feed grove	110	tray
112	carton separator	114	carton stack
120	proximity sensor	122	remove carton light
124	vertical wall		

#### DETAILED DESCRIPTION OF THE INVENTION

The present invention is a vending machine for dispensing flat objects - typically cartons. Throughout this disclosure, the term "carton" will be understood to mean any type of box, garment bag, or other container which can be collapsed into a flat state. These objects are typically made of corrugated cardboard, but can also be made of sheet molding compound, thin gauge metal, and many other materials. The invention is capable of accommodating virtually any type of flat object. However, for purposes of illustration, a stack of collapsed cardboard packing boxes will be used throughout this disclosure.

FIG. 1 shows carton dispensing machine **10** in its assembled state - ready for use. A rectangular cabinet is formed by various panels using common prior art techniques. Base **16**, right side panel **18**, and top panel **20** are shown. A rear panel and left side panel are also present. The front of the cabinet is sealed by main door **12**, which is hinged on its left side. Main door **12** is customarily locked when closed, using the two locks **22**. Display panel **14** is provided on the front of main door **12**. It may simply be a glass frame for accommodating an advertising placard. On the other hand, it may be a sophisticated lighted display as commonly found on soft drink vending machines. The machine is typically located in public areas such as airports. Thus, display panel **14**

is used to attract the attention of potential customers and inform them of the fact that the machine offers boxes for sale.

Control box **24** is attached to the side of the machine. Its front face contains status panel **28** and change panel **32**. Control box door **26** swings open to provide access to the interior in order to perform maintenance functions and to retrieve money deposited in the machine. It is customarily locked by lock **30**. Main door **12** provides access to the cabinet for loading new cartons into the machine. Control box door **26** provides access to the money received within control box **24**. As the functions of loading the cartons and retrieving the money may be performed by different persons, it is advisable to key locks **22** and lock **30** differently.

FIG. 2 is a detail view showing status panel **28** and change panel **32**. Status panel **28** collects money from persons desiring to purchase a carton. Bill receiver **42** - which is familiar to those skilled in the art - is provided to accept paper money. Coin slot **44** is provided to accept coins. A control unit is provided within the machine to count the money received and initiate the various functions the machine performs. LED display **34** informs the user how much money has been deposited. The price required to initiate the vending cycle is set in the control unit. Once this amount of money is received, the vending cycle is initiated. If change is owed, this is delivered through coin return **46**.

Three indicator lights are provided on status panel **28**. Ready light **36** - which is customarily green - indicates that the machine is ready to receive money and vend a box. Exact change light **38** - which is customarily yellow or orange - indicates that the machine is running low on change and that exact change should be provided. Empty light **40** - which is customarily red - indicates that the machine is out of cartons. In this state, of course, ready light **36** will not be illuminated. Remove carton light **122** is also provided. Its function will be explained in the following.

Once a customer has deposited the requisite amount of money, the machine dispenses a carton. Turning now to FIG. 3, the reader will observe the presence of dispenser slot **48** in the side of the machine. This opening passes through to the interior of the cabinet. When the vend cycle is complete, carton **50** will be ejected through dispenser slot **48**, coming to rest approximately in the position shown. Remove carton light **122** will then be illuminated. It may optionally be set to flash in order to gain the customer's attention. The customer then grasps carton **50** and pulls it free of dispenser slot **48** as shown in FIG. 4. A proximity sensor within the machine senses that the carton has been removed and the control unit then resets the machine. Ready light **36** is then re-illuminated (having been switched off during the vend cycle) to indicate that the machine is ready for another purchase. Once carton **50** is free of the machine, the customer can unfold it so that it is ready for use.

FIG. 5 shows the interior details of the cabinet.. Main door **12** is shown in the open position. The interior is designated generally as carton cavity **54**. Left feed assembly **68** is provided to engage and move the left side of the cartons (with "left" being in reference to the view as shown). Right feed assembly **70** is provided to engage and move the right side of the cartons. Left pressure plate **72** and right pressure plate **74** push against the rear of the cartons to advance them toward the front of the cabinet. Cross feed assembly **66** is provided to eject an individual carton out the dispenser slot in the side of the machine.

The machine is capable of handling cartons of varying size. Adjustment means must therefore be provided. The feed mechanisms are generally attached to a set of upper beams **56** and lower beams **58**. Right feed assembly **70** is attached to a pair of fixed columns **60**. Left feed assembly **68** is attached to a pair of adjustable columns **62**. Adjustable columns **62** can be moved left and right to accommodate variations in the width of the cartons - as shown by the arrows. Left feed assembly

**68**, right feed assembly **70**, and cross feed assembly **66** are vertically adjustable in order to accommodate variations in the height of the cartons.

Left side panel **64** completes the structure of the cabinet. Support panel **76** is positioned to carry the weight of the cartons placed within the cabinet. It contains three raised ribs which minimize surface contact between the bottom edge of the cartons and the machine. These features reduce friction as the cartons are fed forward.

FIG. 6 shows left feed assembly **68** removed from the machine for purposes of visualization. Left support beam **80** severs as an attachment point for the other features. Gear motor **82** is attached to its forward end. It controls and turns left drive helix **84** - which rotates in the direction shown. Screw drive **86** is provided to move left pressure plate **72** back and forth in the direction indicated. Left pressure plate **72** is mounted to left backing plate **78**. Left backing plate **78** is attached via a linear bearing to left support beam **80**. When screw drive **86** turns, left backing plate **78** is moved forward or backward, depending on the direction of rotation of screw drive **86**.

Left pressure plate **72** is attached to left backing plate **78** using elastic means, so that left pressure plate **72** can give somewhat with respect to left backing plate **78**. Sensing means are preferably provided for all these drive mechanisms. As a first example, optical sensors can be used to determine the position of the rear of the stack of cartons. The control unit will then activate screw drive **86** to advance left pressure plate **72** until it bears against the rear of the stack. The use of the elastic means in pressure plate **72** eliminates the need for precise motion control. As a second example, it is important that left drive helix **84** undergo one complete revolution per vending cycle. This can be accomplished using a limit switch, optical sensor, or other common means. As these

sensing and control features represent common design choices known in the art, they have not been illustrated.

FIG. 7 shows the details of right feed assembly 70. It is essentially the mirror image of left feed assembly 68. It contains right support beam 88, a second screw drive 86, right backing plate 92, right pressure plate 74, a second gear motor 82, and right drive helix 90. The reader should observe that right drive helix 90 is not necessarily a mirror of left drive helix 84. It may, in fact, be somewhat shorter, so that it releases its engagement with the right side of the carton before left drive helix 84 releases its engagement.

Proximity sensor 120 is provided on the spindle of right drive helix 90. When a carton has been advanced forward via the two feed assemblies and fed transversely through the dispensing slot, proximity sensor 120 senses the presence of the carton. If the customer does not remove the carton at this point, it is undesirable for the machine to feed another carton - as the presence of two cartons in the dispensing slot could cause a jam. Thus, proximity sensor 120 alerts the control unit to the presence of a carton in the dispenser slot and prevents more feeding until it is removed. The position and type of proximity sensor 120 is a matter of design choice. It need not be placed on or near right drive helix 90, so long as it is capable of sensing the presence of a carton. Suitable choices include mechanical limit switches and optocouplers.

FIG. 8 shows cross feed assembly 66. It is supported by cross feed bracket 98, which attaches to the forward adjustable column 62. Transverse screw drive 96 provides controlled reciprocating motion of ejector 94. Ejector 94 incorporates a protrusion which bears against the left side of a carton and pushes it out the dispensing slot.

FIG. 9 is a perspective view of the loaded machine. Main door **12** is removed in the view to expose the internal components. A cutaway is made in left side panel **64** as well. The machine is shown in its ready state. A stack of vertically oriented cartons is contained within the cabinet. Left drive helix **84** and right drive helix **90** engage the left and right edge of lead carton **100**. Next carton **102** is in position to be engaged by the drive helices once lead carton **100** is diepsensed. The reader will observe that the two pressure plates are bearing against the rear of the stack of cartons to urge it forward.

When the controller initiates the vend cycle, the two drive helices turn and lead carton **100** is moved forward. FIG. 10 shows this step. The two drive helices rotate in opposite directions, as shown by the arrows. Lead carton **100** is propelled forward while next carton **102** remains stationary (the features which hold next carton **102** in place will be describe subsequently). The two drive helices rotate until lead carton **100** is ejected from the helices and drops off the front of support panel **76**, falling into tray **110**. It is prevented from tipping forward by cross feed assembly **66** (as well as the inside surface of main door **12** - which is not shown).

FIG. 12 shows the final step in the vend cycle. The screw drive on cross feed assembly **66** is actuated, driving ejector **94** to the right. Lead carton **100** is thereby ejected from the machine. Next carton **102** then assumes the position formerly occupied by lead carton **100** and the cycle is ready to begin anew.

FIG. 13 shows left drive helix **84** in detail. It is viewed from the rear. Holding flange **106** would be facing the forward surface of lead carton **100** in its installed position. It customarily rotates in the direction shown by the arrow. Feed groove **108** - which assumes the form of a helical slot - provides the forward motion of the carton when left drive helix **84** is actuated.

The position shown corresponds to the initiation of a cycle. Vertical wall 124 is, at this point, oriented vertically. The vertical edge of the lead carton (the left edge, when viewed from the front), slips past vertical wall 124 and comes to rest against entrance step 104. The lead carton's edge is therefore poised to enter feed groove 108. When left drive helix 84 is rotated in the direction shown, carton separator 112 rotates between the edge of the lead carton and the next carton - thereby separating the two. Holding flange 106 rotates in front of the next carton, preventing its moving forward while the drive helix goes through one revolution. The lead carton is therefore propelled forward and ultimately out of the drive helix while the next carton is held in place. Once the drive helix rotates through 360 degrees and returns to the position shown, the next carton pops forward past vertical wall 124 and into entrance stop 104. These operations are detailed in the following views.

FIG. 14 is a detail view showing the start of the cycle. The edge of lead carton 100 is resting in entrance stop 104. When left drive helix 84 rotates as shown, carton separator 112 will pass behind the edge of lead carton 100 and in front of the edge of next carton 102. Feed groove 108 then propels lead carton 100 forward. FIG. 15 shows left drive helix 84 after it has rotated 180 degrees. Lead carton 100 has been propelled forward, while next carton 102 is held in place by holding flange 106.

FIG. 16 shows left drive helix 84 after one complete revolution. Lead carton 100 has been propelled forward and out of the drive helices, dropping down into tray 110. The reader will also observe that next carton 102 has moved forward into entrance stop 104.

FIG. 17 shows the actuation of ejector 94. The inward facing protrusion on ejector 94 bears against the edge of lead carton 100 and propels it toward the machine's right side, where it is ejected

through the ejection slot. Tray **110** and ejector **94** guide its lateral motion. Features on the inside of the main door - such as roller or runners - can also be employed to ensure that lead carton **100** passes through the dispenser slot and out of the machine. After the completion of the lateral ejection, the machine is ready to begin a new cycle. Once the customer has grasped and removed lead carton **100** (and proximity sensor **120** has indicated such), a new cycle can begin.

The vending cycles continue until the machine exhausts its supply of cartons. It must then be reloaded. The controller, once it senses the exhaustion of the carton supply, retracts the two pressure plates to their rearmost position. FIG. 18 shows the machine with the main door open. A service person then loads carton stack **114** into the machine as shown. Of course, cartons can also be loaded individually.

Common prior art features can be added to facilitate the reloading process. As an example, the left, right, and cross feeding assemblies can be mounted on hinges to swing out of the way when the machine is to be loaded. As such principles are well known in the art, they have not been illustrated in detail.

The preceding descriptions contain significant detail regarding the novel aspects of the present invention. They should not be construed, however, as limiting the scope of the invention but rather as providing illustrations of the preferred embodiments of the invention. Thus, the scope of the invention should be fixed by the following claims, rather than by the examples given.